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Physical Mechanisms that give rise to anti-correlation between SBS and SRS reflectivities

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Mechanisms are explored which may have contributed to the observed anti-correlation between peak SRS and SBS reflectivities in gas bag NOVA targets (Montgomery 96) and elsewhere. The correlation between SBS and LDI spatial gains in the presence of velocity fluctuations and at different ion wave damping levels is studied as a possible source of anti-correlation between SRS and SBS in as much as LDI plays a dominant role in saturating SRS. A kinetic model which yields enhanced SRS in hot spots where the electron velocity distribution has been modified to reduce tails, and hence Landau damping, is also explored. Lateral heat transport due to steep temperature gradients across hot spots is invoked as the source of the modified distribution functions. The exclusion of SBS from such hot spots due to enhanced SRS dynamics is yet another model which would predict anti-correlation between SRS and SBS including the sudden increase of SBS reflectivities with a reduction of density when SRS would be suppressed due to Landau damping and SBS could now take place in laser hot spots. This second model ties the anti-correlation to the question of access to laser hot spots. It would not apply for instance, at high enough densities, where Raman backscattering itself is no longer limited to hot spots.

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